

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes site preparation, excavation, surface water control, excavation dewatering, stockpiling, compacted fill, subgrade preparation, and earthwork materials.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 - Surveying
- B. Section 02110 - Clearing, Grubbing, and Stripping
- C. Section 02215 - Trenching and Backfilling
- D. Section 02225 - Compacted Clay Liner and Cap
- E. Section 02230 - Road Construction
- F. Section 02250 - Vegetative Soil Layer
- G. Section 02270 - Erosion and Sediment Control
- H. Section 02271 - Riprap
- I. Section 02280 - Biointrusion Barrier
- J. Section 02710 - Granular Drainage Material
- K. Section 02712 - Granular Filter Material
- L. Section 02920 - Topsoil
- M. Section 02930 - Vegetation

- N. Section 13000 - Borrow Area Management
- O. Section 13010 - Impacted Material Placement
- P. Surface-Water Management and Erosion Control (SWMEC) Plan, Revision 0, May 1997
- Q. Borrow Area Management and Restoration Plan (BAMR), Revision 0, May 1997
- R. Part 6 - Statement of Work
- S. Part 8 - Environmental Health and Safety, and Training Requirements
- T. Part 9 - Quality Assurance Requirements

1.03 REFERENCES

- A. Latest version of American Society for Testing and Materials (ASTM) Standards:
 - 1. ASTM D 698. Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using a 5.5-lb (2.49-kg) Rammer and 12-in. (305-mm) Drop.
 - 2. ASTM D 2487. Standard Test Method for Classification of Soils for Engineering Purposes.
- B. Reference Reports addressing OSDF and borrow area site subsurface conditions:
 - 1. *"Geotechnical Investigation Report, On-Site Disposal Facility"* [Parsons, 1995]. This report contains geotechnical data for the subsurface soils in the OSDF area.
 - 2. *"Disposal Facility Pre-Design Geotechnical Investigation, Soil Investigation Data Report, CERCLA/RCRA Unit 2"* [Science Applications International, 1995]. This report presents geotechnical data for the subsurface soils in the OSDF area.
 - 3. *"Geotechnical Data and Evaluation Report for East and South Field Borrow Areas"* [Parsons, 1996]. This report contains geotechnical data for the subsurface soils in the borrow area.

1.04 SUBMITTALS

- A. Within 15 calendar days from Notice to Proceed, submit to the Construction Manager for review an Earthwork Work Plan. Earthwork Work Plan shall include, at a minimum:
 - 1. list of equipment proposed for the construction activities including earthwork and for scope of work specified in Sections 02110, 02215, 02225, 02230, 02250, 02271, 02280, 02710, 02712, 02920, 02930, 13000, and 13010;

2. construction methods for each construction activity;
3. dewatering methods and techniques;
4. method for removal of rock from the compacted fill;
5. coordination of survey requirements for the earthwork;
6. proposed and existing locations of soil stockpile areas;
7. coordination of earthwork activities with surface-water management and erosion and sediment control measures;
8. schedule for earthwork activities;
9. coordination of dust control; and
10. plan and measures to be taken during cold weather activities below 32 degrees Fahrenheit (F).

1.05 VERIFICATION OF THE EXISTING CONDITIONS

- A. Existing site surface and subsurface conditions, based on available site data, are indicated on the Construction Drawings and on the reference drawings and in the Reference Reports specified in this Section.
- B. For verification of the existing conditions, refer to Section 02100.

1.06 HEALTH AND SAFETY REQUIREMENTS

- A. Environmental, health and safety, and other training requirements shall be as specified in Part 8 of the Contract Documents.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Obtain material for compacted fill from the On-Site Disposal Facility (OSDF) cell excavation and stockpiles shown on the Construction Drawings included in this Contract. Obtain additional compacted fill material, if required, from the on-site borrow area indicated on the Construction Drawings. Borrow area management shall be in accordance with Section 13000 and the BAMR Plan.
- B. Suitable fill material shall be free of debris, foreign objects, large rock fragments, organics, and other deleterious materials. Visible rock particles shall be maximum dimension of 5 inches for nominal 8-inch loose lifts and 3 inches for nominal 4-inch

lower lifts. Fill material shall classify as GC, SC, SM, ML, CL, or CH according to the Unified Soil Classification System (per ASTM D 2487).

- C. Clayey rockfill: Material from existing clayey rockfill stockpiles shown on the Construction Drawings and material from compacted clay liner screening and processing may be substituted for compacted fill below subbase aggregate elevations in the impacted material haul road/cell access road, access corridor located outside the perimeter berm baseline, borrow area haul road, and other fill areas outside the perimeter berm baseline approved by the Construction Manager.
- D. Construction safety fence shall be orange, high density polyethylene, 4-foot height, opening size approximately 4 inches by 1/2 inch, minimum tensile strength of 2000 pounds per foot of width. Where used to delineate radiologically controlled areas, the color shall be yellow. Posts shall be T-shaped, 1-1/2 inch by 1-1/2 inch, 3/16 inch thick by 7 feet, and made of long, and made of galvanized steel.

2.02 EQUIPMENT

- A. Furnish compaction equipment to achieve the required minimum soil dry density within the range of acceptable moisture contents.
- B. Furnish hand compaction equipment, such as walk-behind padfoot compactor, hand tampers, or vibratory plate compactor, for compaction in areas inaccessible to large compaction equipment.
- C. Furnish water tank trucks, pressure distributors, or other equipment designed to apply water uniformly and in controlled quantities to variable surface widths to provide the required in-place moisture content and to prevent drying of soil surfaces.
- D. Furnish equipment such as scarifiers, disks, spring tooth or spike tooth harrows, earth hauling equipment, and other equipment, as required for earthwork construction.

PART 3 EXECUTION

3.01 GENERAL

- A. Perform construction activities in such a manner that equipment operating in the radiologically controlled areas (RCA) do not operate in non-RCA. Equipment operating

in an RCA shall be decontaminated and radiologically surveyed by the Construction Manager prior to exiting for use in non-RCA areas.

3.02 SITE PREPARATION

- A. Install construction safety fence and radiological-control fence as shown on the Construction Drawings. Provide construction fence and barricades around trenches and excavated areas as specified in Part 8 of the Contract Documents.
- B. Install erosion and sediment controls in the relevant areas of construction as shown on the Construction Drawings and as required by Section 02270. Maintain the erosion and sediment controls for the duration of the Contract and until the contained areas are vegetated in accordance with Section 02930. Accumulated sediment behind silt fences and sediments removed from the existing On-Site Disposal Facility (OSDF) sedimentation basin installed in the non-certified area shall be disposed in the OSDF.
- C. Prior to any earthwork activity, perform clearing, grubbing, and stripping as indicated on the Construction Drawings and in accordance with Section 02110.
- D. Construct haul roads and access corridors in accordance with the Construction Drawings and Section 02230.
- E. Locate existing manholes, drop structures, monitoring wells, piezometers, lysimeters, utilities, and other subsurface structures in the work area. Protect these structures and utilities during the excavation and grading activities in accordance with the Construction Drawings and Reference Drawings.

3.03 SURFACE-WATER CONTROL

- A. Installation of surface water and erosion controls shall be in accordance with approved Surface-Water Management and Erosion Control Plan as specified in Section 02270.
- B. Install surface-water and erosion controls in and around work areas to control runoff and erosion and to prevent surface-water runoff into OSDF excavations in accordance with Section 02270. Perimeter controls may include shallow ditches, small berms, or localized regrading.

3.04 EXCAVATION

- A. Excavate designated areas to the subgrade elevations or excavation limits shown on the Construction Drawings. Stockpile excavated material in the Contractor Work Area or other areas designated by the Construction Manager for use in subsequent construction under this contract.
- B. Excavate material within the excavation limits, including any rock encountered, regardless of type, character, composition, and condition.
- C. Blasting, including use of explosives or explosive devices, shall not be permitted.
- D. Excavated material defined in the Construction Drawings or by the Construction Manager as impacted will be evaluated by the Construction Manager to establish that it meets waste acceptance criteria (WAC) for the OSDF. Load, haul, and unload any material not meeting the OSDF WAC in an area designated by the Construction Manager. The Contractor will assume responsibility for management of loading, hauling, unloading, and placement of impacted excavated material meeting the OSDF WAC in the OSDF in accordance with Section 13010.
- E. Minimize sloughing and caving of the excavation. Over-excavate and fill areas of the excavation that cave or sluff with compacted fill in accordance with this Section.
- F. Over-excavate abandoned monitoring wells, borings, and lysimeters within the OSDF perimeter baseline as shown on the Construction Drawings to a minimum depth of 3 feet below subgrade elevation. Fill to subgrade elevation with compacted fill in accordance with this Section.
- G. Do not remove soil from the site or dispose of soil included in this Contract except as approved in writing by the Construction Manager.
- H. Perform activities in such a manner that hauling equipment transporting non-impacted material does not operate on impacted material haul roads. Decontaminate any equipment that drives on impacted material haul roads or in an impacted area prior to being used for earthwork activities in non-impacted areas.
- I. Perform activities in such a manner that earthwork and hauling equipment working in contamination areas does not cross into controlled areas. Wheel wash and perform radiological control survey prior to driving into controlled areas.

- J. Remove the existing North Entrance Road pavement within the limits shown on the Construction Drawings and haul and place in OSDF. Existing North Entrance Road pavement section consists of 6 inches of asphaltic concrete over 6 inches crushed rock. Excavate 2 feet below pavement elevation and haul and place excavated material in OSDF.
- K. Do not leave an area in an exposed condition without seeding for more than forty-five (45) calendar days. If an exposed excavation area will not be worked for a period of 45 calendar days, the soils shall be stabilized within 7 calendar days of excavation by one of the following methods:
 - 1. during the seeding season, temporary seeding shall be applied as specified in Section 02930; or
 - 2. during the non-seeding season, crusting agents shall be applied as specified in this Section.

3.05 EXCAVATION DEWATERING

- A. Anticipate seepage of ground-water into, and accumulation of surface-water runoff in excavations. Manage ground-water and surface-water runoff in excavations in accordance with this Section.
- B. Collect ground water that accumulates in the excavation in a toe drain, or other suitable sump, and pump to the Fernald Environmental Management Project (FEMP) Former Production area drain control system, the leachate transmission system, or other locations directed by the Construction Manager.
- C. Prevent surface-water runoff from adjacent areas from entering the excavation.

3.06 STOCKPILING

- A. Stockpile excavated soils at the areas indicated on the Construction Drawings or as designated by the Construction Manager.
- B. Construct stockpiles no steeper than 3H:1V (horizontal:vertical), grade to drain, seal by tracking perpendicular to the slope contours with a dozer, and dress daily during periods when fill is taken from the stockpile.
- C. Do not leave a stockpile in an exposed condition without seeding for more than forty-five (45) calendar days. Stockpiles that are to be inactive for a period of 45 calendar days shall

be stabilized within 7 calendar days by means of crusting agents, as specified in this Section.

3.07 SUBGRADE PREPARATION

- A. Subgrade material shall consist of soil free of debris, foreign objects, organics, and other deleterious materials.
- B. In the event saturated subgrade is encountered, localized sumps shall be constructed to facilitate removal of water.
- C. Perform subgrade proofrolling by driving a loaded dump truck (minimum weight of 10 tons per axle and minimum loaded weight of 20 tons) or other pneumatic-tired vehicle, back and forth across the area to be prepared to confirm the firmness of subgrade surface. Overlap the passes such that one set of tires on each pass runs between the two sets of tire tracks from the previous pass. Soils shall not exhibit pumping or develop ruts more than two inches in depth. Minor rutting, defined as less than two inches in depth, shall be regraded or covered with suitable soil to match finish grade, as specified.
- D. Subgrade for the compacted clay liner or cap shall be scarified as specified in Section 02225. At other locations where compacted fill is to be placed, prepare the subgrade by scarifying to a depth of 2 inches using the equipment identified in this Section.
- E. In areas where unsuitable soils are encountered, remove and replace the soil to a minimum depth of 1 foot below the proposed subgrade elevation. Suitable soil exhibiting pumping or developing ruts more than two inches in depth, remove soil to a minimum depth of 1 foot or dry the material in place by a method approved by the Construction Manager. Fill areas from which subgrade has been removed with compacted fill in accordance with the requirements of this Section. Compact the fill material to at least 95 percent standard Proctor maximum dry density with moisture content not greater than 3 percentage point wet of the standard optimum moisture content (ASTM D 698). Compact the uppermost lift of compacted fill beneath road and access corridor alignments to at least 100 percent of the standard Proctor maximum dry density.
- F. In excavations or other areas where water accumulates, implement measures to remove the water in accordance with this Section. Maintain the subgrade surface free of standing water and in a firm condition to meet the proof rolling requirements of this Section. Maintain dewatered areas in this condition until overlying construction is complete.

- G. Manage surface water as described in Section 02270 and the Surface-Water Management and Erosion Control Plan.

3.08 COMPACTED FILL

- A. Use fill that meets the requirements of this Section. Place the fill to the limits and grades shown on the Construction Drawings.
- B. Place compacted fill material on surfaces which are free of debris, branches, vegetation, mud, ice, or other deleterious material.
- C. Place compacted fill material in loose lifts with a thickness of 8 inches \pm 1 inch. In areas where compaction is to be performed using hand-operated equipment, place the fill material in loose lifts with a loose thickness of 4 inches \pm 1 inch.
- D. Remove visible rock particles with a maximum dimension larger than 5 inches for nominal 8-inch loose lifts and 3 inches for nominal 4-inch loose lifts.
- E. Prior to placing a succeeding lift of material over a previously compacted lift, thoroughly scarify the previous lift to a depth of 2 inches by discing, raking, or tracking with a dozer. Moisture condition the preceding lift in accordance with this Section if the moisture content of the surface of the preceding lift is not within the range of acceptable moisture contents.
- F. The trafficking of scarified surfaces by trucks or other equipment, except compaction equipment, is not permitted.
- G. The maximum acceptable soil clod size after processing is 3 inches. Reduce clod size by discing, raking, tracking with a dozer, using a soil stabilizer, or other means. Soil clumps, consisting of an agglomeration of smaller clods, will not be considered a clod for purposes of this Section.
- H. Except as specified in this Section, compact fill material in each lift to at least 95 percent of its standard Proctor maximum dry density (ASTM D 698). Compact fill at a moisture content within \pm 3 percentage points of the standard Proctor optimum moisture content (ASTM D 698).
- I. Moisture condition the soil if the moisture content of the soil to be used as compacted fill is not within \pm 3 percentage points of the optimum moisture content as determined by ASTM D 698. Use a water truck and spray nozzle for wetting. During wetting or drying,

regularly disc, rake, or otherwise mix the material to thoroughly blend the moisture throughout the lift. Use discing, raking, or other appropriate methods to dry the material as required.

- J. Do not place frozen fill nor place fill material on frozen subgrade or previously placed compacted fill.
- K. Do not compact fill material at temperatures below 32 F, unless authorized in writing by the Construction Manager.
- L. Do not place fill during periods of precipitation. Placement may occur during periods of misting or drizzle, but only if authorized by the Construction Manager.
- M. Dust control shall be in accordance with Part 6.

3.09 CLAYEY ROCKFILL

- A. If the material from a clay liner material processing, referred to as clayey rockfill, is used it shall be placed in maximum 12-inch thick loose lifts and compacted with minimum of four (4) passes of a Caterpillar 815B compactor. Rock size greater than 12-inches shall be removed from the fill and stockpiled for future use in areas as designated by the Construction Manager. Any compacted clayey rockfill material exhibiting excessive pumping due to wet material or insufficient compaction shall be dried and recompactd or removed from the fill. Only use clayey rockfill as allowed by this Section or as otherwise approved by the Construction Manager.

3.10 CONSTRUCTION QUALITY REQUIREMENTS

- A. CQC Consultant will perform soil conformance testing on compacted fill to establish compliance with this Section. Conformance testing to be performed and testing frequencies are given in the Construction Quality Assurance (CQA) Plan referenced in Part 9 of the Contract Documents. Provide equipment and labor to assist the CQC Consultant in obtaining conformance samples from excavations, stockpiles, and borrow areas. Identify source(s) and quantity of fill material required from each source at least 15 calendar days prior to use.
- B. CQC Consultant will perform soil performance testing on compacted fill lifts to evaluate compliance with this Section. Performance testing to be performed and testing frequencies are given in the CQA Plan.

- C. If CQC Consultant's tests indicate that any portion of the compacted fill does not meet the requirements of this Section, CQC Consultant will delineate the extent of the nonconforming area. Rework the nonconforming area until it meets the requirements of this Section.
- D. CQC Consultant will witness the proofrolling of subgrade and provide Construction Manager documentation approving subgrade.

3.10 SURVEY CONTROL

- A. Survey the limits and elevations of excavations, subgrade, and top of the compacted fill in accordance with Section 02100.

3.11 TOLERANCES

- A. Perform the earthwork construction to within ± 0.3 ft of the grades indicated on the Construction Drawings except for subgrade for the compacted clay liner, access corridor, and roads for which earthwork construction shall be within -0.3 ft to +0.1 ft of the grades indicated unless otherwise indicated.

[END OF SECTION]